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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/722,749	11/26/2003	Hon-Sum P. Wong	YOR920030513US1	7287

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EXAMINER

MONBLEAU, DAVIENNE N

ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 11/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/722,749

Applicant(s)

WONG, HON-SUM P.

Examiner

Davienne Monbleau

Art Unit

2878

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-11 and 13-20 is/are pending in the application.
- 4a) Of the above claim(s) 18-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-11 and 13,17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

The amendment filed on 11/9/05 has been entered. Claims 1, 3, 8, 9, 11, 13, and 14 have been amended. Claims 2 and 12 have been canceled. Claims 18-20 were previously withdrawn from consideration as being drawn to a non-elected group. Claims 1, 3-11, and 13-20 are pending.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-11, and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merrill.

Regarding Claim 1, *Merrill* teaches in Figure 8 an imaging sensor comprising a plurality of pixels, where each of said pixels comprises a semiconductor substrate (40), a three-dimensional, vertical stack of color sensors (41, 46, 51) on the semiconductor substrate (40), and a plurality of color reflectors (43, 48), wherein each pair of color sensors is separated by one of said color reflectors (43, 48). *Merrill* does not teach that the semiconductor substrate (40) and the three-dimensional, vertical stack of color sensors is separated by one of said color reflectors. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to place a color reflector between the semiconductor substrate (40) and the three-dimensional, vertical stack of color sensors to enable the light to pass through the lowest color

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sensor twice (similar to the first color sensor). This will maximize the amount of light absorbed in that particular color sensor.

Regarding Claim 11, *Merrill* teaches in Figure 8 an imaging sensor comprising a semiconductor substrate (40) and a pixel matrix (column 5 lines 30-35) comprised of a plurality of pixels, wherein each pixel includes a three-dimensional stack of color sensors (41, 46, 51) on said semiconductor substrate (40), and a plurality of color reflectors (43, 48), wherein each pair of color sensors is separated by one of said color reflectors (43, 48). *Merrill* further teaches in column 15 lines 49-52 that each color sensor has connectors to readout circuitry in order to provide readout capabilities and detect the amount of incident light on each color sensor. Lastly, *Merrill* teaches in column 5 lines 25-35 that the sensors may be arranged in an array to form an image detector with circuitry for converting photo-generated carriers produced in the sensors to electrical signals. Typically, in an image array of this sort (i.e. a CCD), this includes row decoder and a column decoder. Although *Merrill* does not specifically teach the arrangement of each sensor/pixel in relation to readout rows/columns, it would have been obvious to one of ordinary skill in the art at the time of the invention to have each pixel located adjacent to one of said crossings of row and column conductors in said array in order to provide efficient charge readout of said image sensor. *Merrill* does not teach that the semiconductor substrate (40) and the three-dimensional, vertical stack of color sensors is separated by one of said color reflectors. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to place a color reflector between the semiconductor substrate (40) and the three-dimensional, vertical stack of color sensors to enable the light to pass through the lowest color

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sensor twice (similar to the first color sensor). This will maximize the amount of light absorbed in that particular color sensor.

Regarding Claims 3 and 13, *Merrill* teaches in Figure 8 that each color reflector (43, 48) reflects a different color spectrum.

Regarding Claims 4 and 16, *Merrill* teaches in column 17 lines 38-43 that interference filters may be used but does not specifically teach a Bragg reflector. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to use a Bragg reflector in *Merrill* because it is a type of interference filter and may reflect certain wavelengths of light and pass others.

Regarding Claim 5, *Merrill* teaches in column 15 lines 49-52 that each color sensor has connectors to readout circuitry in order to provide readout capabilities and detect the amount of incident light on each color sensor.

Regarding Claims 6 and 17, *Merrill* teaches in 8 that each color sensor (41, 46, 51) includes a photo-sensor (column 15 line 57 to column 16 line 3) and a plurality of transistors (Figure 2A) for interrogating photo-induced charges generated by said photo-sensor.

Regarding Claim 7, *Merrill* teaches in column 22 lines 39-46 using conventional CMOS processes to separate the sensor groups.

Regarding Claim 8, *Merrill* teaches in column 5 lines 25-35 that the sensors may be arranged in an array to form an image detector with circuitry for converting photogenerated carriers produced in the sensors to electrical signals. Typically, in an image array of this sort (i.e. a CCD), this includes row decoder and a column decoder.

Regarding Claims 9 and 14, *Merrill* teaches in Figure 8 that the color reflector (which would be a red color reflector) that reflects the longest set of wavelengths (red) is positioned between the semiconductor substrate (40) and the three-dimensional stack of color sensors, and wherein the color reflector (48) that reflects the shortest set of wavelengths (blue) is positioned furthest from said semiconductor substrate (40).

Regarding Claims 10 and 15, *Merrill* teaches in Figure 8 that each color sensor (41, 46, 51) has a different thickness, wherein the thickest color sensor (41) is adjacent to said color reflector (would be the red color filter) that reflects the longest set of wavelengths (red), and wherein the thinnest color sensor (51) is furthest from said semiconductor substrate (40).

Response to Arguments

Applicant's arguments filed 11/9/05 have been fully considered but they are not persuasive. In particular, Applicant argues (response, page 7) that *Merrill* does not teach “separating a semiconductor substrate from a three-dimensional, vertical stack of color sensors by a color reflector”, but offers no additional argument as to why the Examiner’s motivation is incorrect. Applicant’s argument is not persuasive because *Merrill* teaches (Figure 8) separating each pair of adjacent color sensors (41, 46, 51) with a color reflector (43, 48) for the purpose of reflecting desired wavelengths back through the corresponding sensor for detection. This same objective for the third sensor (41) would be achieved by placing a color reflector between it and the semiconductor substrate (40). Thus, the overall detection ability (sensor absorption of desired wavelength) of the third sensor (41) would be improved, as it is with the first and second sensors (46, 51). (See *Merrill* column 16, lines 50-67.)

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Davienne Monbleau whose telephone number is 571-272-1945. The examiner can normally be reached on Monday through Friday 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

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system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Danielle Marbleau

DNM

Georgia J. Epps

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